

Field Study of *Phyciodes batesii* (Reakirt) and *P. tharos* (Drury) from a Site in the Black Hills, South Dakota (Lepidoptera: Nymphalidae: Melitaeinae)¹

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Abstract. Maculation and male genitalic structure are discussed for two sympatric populations of *Phyciodes* at a study site in the Black Hills, South Dakota. Evidence suggests naturally occurring hybrids.

Introduction

In a recent publication (Ferris & Brown, 1981), Ferris alluded to a problem in identifying certain species of *Phyciodes* from the Black Hills, South Dakota. Data presented by Oliver (1979, 1980) concerning his studies of *Phyciodes batesii* (Reakirt) and *P. tharos* (Drury) now make possible relatively easy separation of these two species.

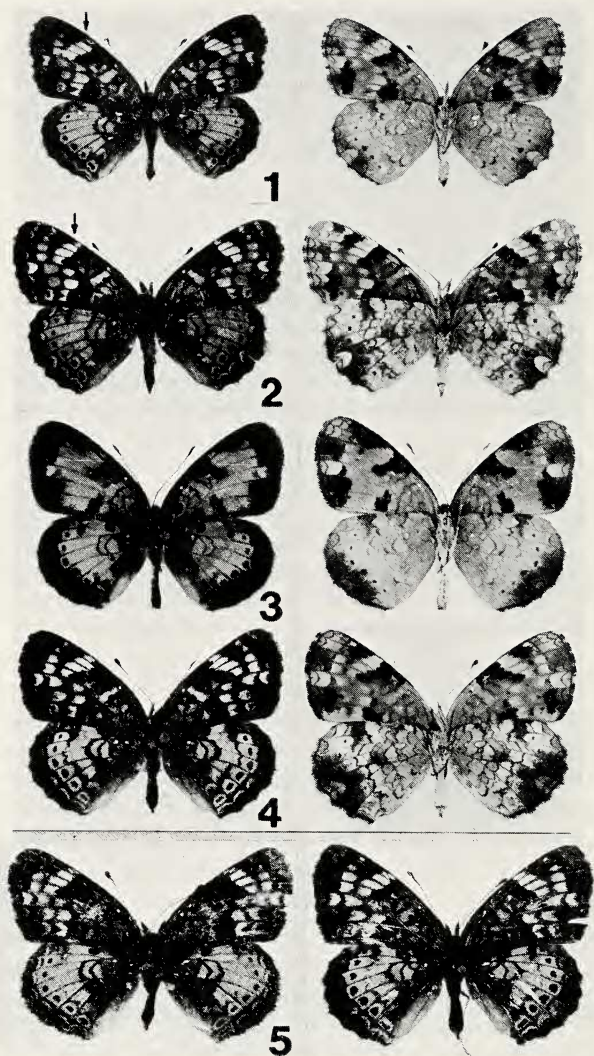
To summarize Oliver's findings (1980), two separate forms of *P. tharos* exist, which he has designated as types A and B. Type A is mutivoltine; type B is univoltine. According to Oliver, in the western United States, type B, generally designated as *P. tharos pascoensis* Wright, is found above 8000' (2440 m), while type A is found in moist canyons below 7000' (2135 m). He reported that both types are sympatric in the Black Hills.

Oliver has also indicated (*in litt.*) that the ventral color of the antennal clubs can be used in some instances to separate *tharos* types A and B. Where applicable, the color in A is black or dark gray, while it is orange or yellowish in B. In northern plains populations, however, light-colored antennal clubs are a fixed character. Here types A and B are best separated by voltinism and the size and extent of the dorsal dark markings in the males. Type B specimens manifest broad dark wing borders.

My studies were conducted in a side canyon perpendicular to Little Spearfish Creek Canyon (shown on some maps as Tinton Creek Canyon), just behind the Timon Campground, Custer National Forest, Lawrence Co., South Dakota, 5700' (1740 m). *Phyciodes* populations in this area

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- Fig. 1. *P. batesii* (male) from Black Hills study site, 22 July 1973, dorsal left, ventral right.
- Fig. 2. *P. batesii* (female) same data, dorsal left, ventral right.
- Fig. 3. *P. tharos* type B (male) from Black Hills study site, 22 July 1973, dorsal left, ventral right.
- Fig. 4. *P. tharos* type B (female) same data, dorsal left, ventral right.
- Fig. 5. Melanic females of *P. batesii* (left) and *P. tharos* type B (right) from Black Hills study site; *tharos* collected on 22 July 1973; *batesii* collected on 27 July 1977.

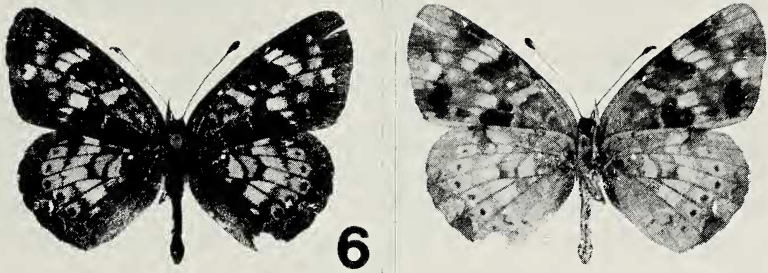


Fig. 6. Possible hybrid male *P. batesii* X *tharos* type B from Black Hills study site, 22 July 1973, dorsal left, ventral right.

were sampled in 1969, 1970, 1973 and 1977.

At this study site, I have found only *tharos* type B and *batesii* on the wing during the month of July, the time of year I have visited this area. Based upon my field experience, *tharos* type B appears to predominate in the Rocky Mountain region, from northern New Mexico northward into Alberta and British Columbia.

The antennae of *P. batesii* have ventrally black tips. This permits rapid separation of the two species when *batesii* is sympatric with type B *tharos*. Males of the two species are relatively easily separated based upon dorsal maculation. *P. batesii* is generally much darker overall than *tharos*, with heavy black scaling. It also has a two-tone appearance owing to the light color of the postdisical band (indicated by the pointer in Figs. 1 & 2). The females are not so easily separated based upon maculation, particularly when they are somewhat melanic, as shown in Fig. 5. The females of both species have a two-tone aspect dorsally, which in *tharos* sometimes approximates *P. pratensis* (Behr). Generally, *batesii* females have a bright aspect with sharply defined maculation, while *tharos* tends to have a blurred appearance.

As noted by Oliver (1979), *tharos* and *batesii* have achieved similar phenotypes, but through different genetic means, as his hybridizational studies have shown. Natural hybrids are apparently rare. Laboratory studies indicate strong behavioral isolating mechanisms during courtship.

Five field-collected specimens, three males and two females, from the Black Hills exhibit hybrid characteristics. All five have type B *tharos* antennae (orange tip color ventrally). The three males resemble *batesii* dorsally. Ventrally one resembles *tharos*; the two others *batesii*. These latter two bear a fairly close resemblance to the hybrid specimen illustrated by Oliver (1979, Fig. 1c). One of these specimens is shown in Fig. 6. Black Hills *batesii* differ significantly in phenotypic appearance from the New York state population used by Oliver in his breeding studies (*op. cit.*). Consequently, one would expect possible *batesii* X *tharos*

hybrids from the Black Hills to differ somewhat in appearance from crosses between individuals from eastern populations.

The two females dorsally are intermediate with regard to the Black Hills populations studied. Ventrally they are pale, and not nearly so heavily marked as is typical *tharos*. Four of the specimens show no structural abnormalities of the abdomen as described by Oliver for laboratory hybrids. The remaining specimen, the first male described above, has a very contorted abdomen, but under the microscope it cannot be ascertained clearly if this results from a structural defect, or is simply an artifact of field handling and subsequent desiccation.

Genitalic Studies

There are differences in the male genitalia between *tharos* and *batesii*. The key structures are the horn-like processes extending from the posterior of the last tegumen (uncus). Fig. 7A depicts typical type B *tharos* from the Black Hills. Note the squarish aspect of the overall structure. Fig. 7B illustrates *batesii* from the Black Hills. The overall structure here presents a rounded aspect with a more acute angle at the base of the processes than occurs in type B *tharos*.

The three possibly hybrid males noted above have genitalia of the form shown in Fig. 7C. This structure is intermediate between those shown in Figs. 7A, B.

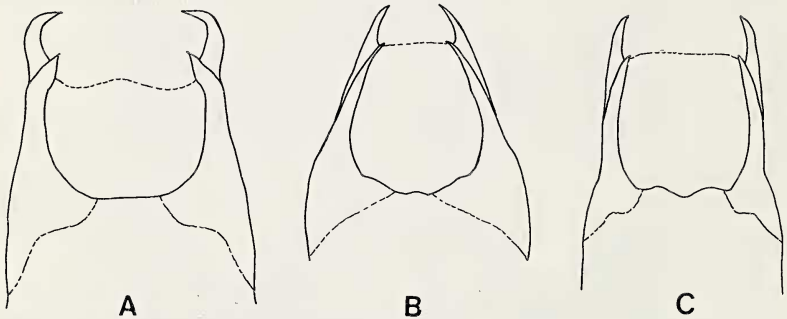


Fig. 7. Diagnostic portion of male genitalia of *P. tharos* type B and *P. batesii*. A. *P. tharos* type B. B. *P. batesii*. C. Apparent *P. tharos* X *batesii*. Genitalia from specimen shown in Fig. 6.

Results and Conclusions

On the basis of genitalic characters, it appears that the three males described above represent natural hybrids *batesii* X *tharos* type B. The two females remain enigmatic since the genital structures in that sex are not diagnostic.

The apparent hybrid specimens were collected accidentally and at random. They were not discovered until recently when the author revised

the arrangement of *tharos* and *batesii* in his collection based upon Oliver's studies.

Analysis of collecting records indicates that 90 males and 27 females of *tharos*, and 9 males and 6 females of *batesii*, with the additional five apparent hybrids were collected in the study region. Of this total number, 44 males and 16 females of *tharos* type B, and 8 males and 5 females of *batesii* were collected on 22 July 1973. Type B *tharos* is clearly the predominant *Phyciodes* at the study site, and perhaps accounts for the apparent hybrids. Not all *Phyciodes* observed, however, were collected. Hence the true ratio of *tharos* to *batesii* may not be represented by the numbers given.

The study site reported in this paper is on the eastern slope of the Black Hills. In July 1982, type B *tharos* and *batesii* were taken sympatrically on the western slope in the Black Hills National Forest, Crook Co., Wyoming.

Also in July 1982, these two species were found flying together in Monroe Canyon, 4400' (1340 m), Sioux Co., Nebraska (Pine Ridge region). Males of both species were taken at mud along the banks of a small stream. To date, no natural hybrids have been found in this area, but only limited numbers of the two species have been collected.

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